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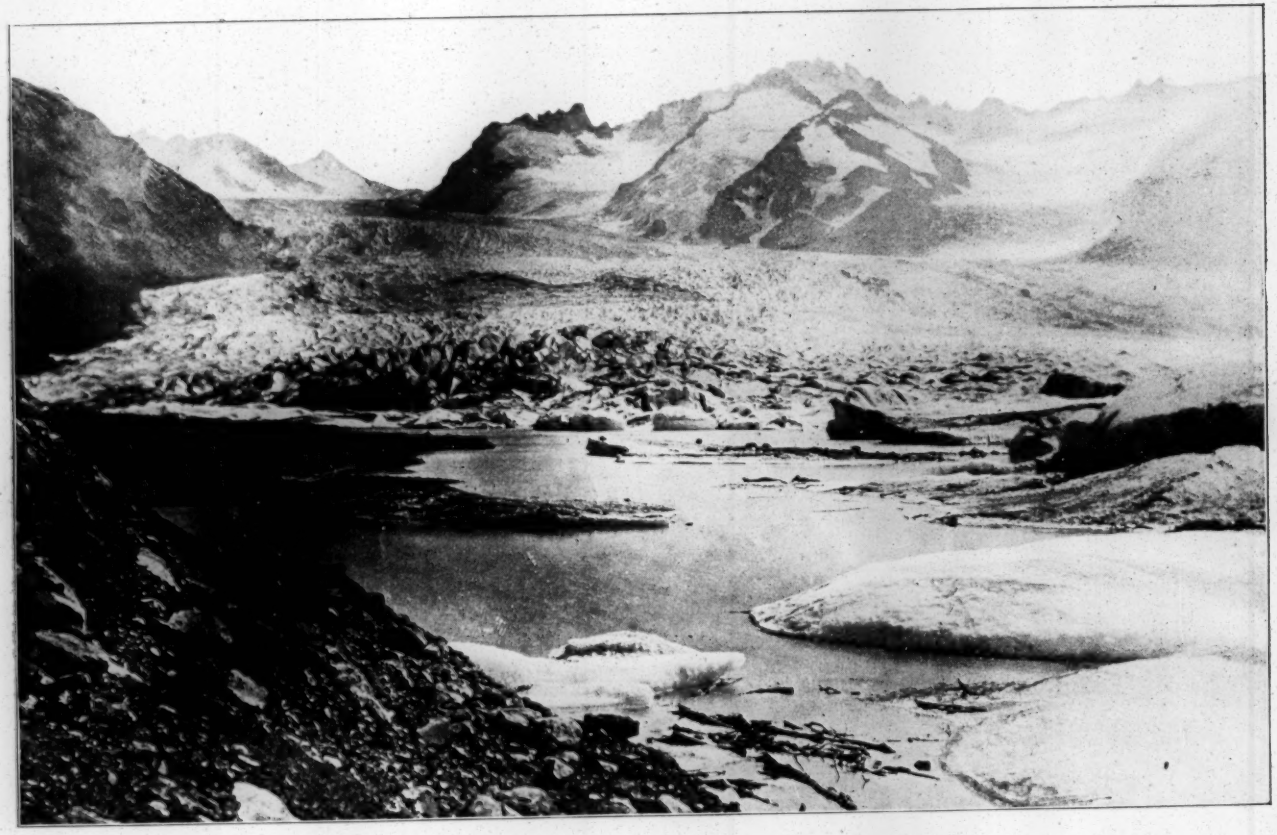

MAYER GLACIER, HEAD OF MAYER RIVER, CORDILLERAS, PATAGONIA

From a Photograph by J. B. Hatcher

THE

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PATAGONIA

By J. B. HATCHER,

Of Princeton University

Patagonia (from the Spanish *patagon*, a large or clumsy foot) is the name commonly applied to that portion of South America lying between Rio Negro on the north and the Strait of Magellan on the south, and embraced by the Atlantic and Pacific oceans. It thus has an extent from north to south of about 1,000 miles and a maximum breadth of nearly 500 miles. The name dates from 1520, when Magellan, on his voyage around the world, observing near his winter quarters at San Julian certain large human footsteps (patagones) gave that name to the country.

Although Spanish settlements were founded at San Felipe and at other places in Patagonia as early as 1579, more than forty years before the landing of the Pilgrims at Plymouth Rock, yet it is still a very sparsely settled and little known country, especially throughout the interior of the central region. With the exception of the settlements along Rio Negro and the Welsh colonies on the river Chubut, there are no important settlements in the interior, and in the country lying to the south of the latter stream the entire settlements are confined to a few sheep farms scattered along the eastern coast from Port Desire to Sandy Point (Punta Arenas) in the Strait of Magellan. On the western coast there are a few unimportant settlements at Otway Station and Skiring Water in the extreme south; while on the north most of the settlements are confined to Chiloe and the other larger islands. The western coast of the mainland and most of the interior is inhabited only by roving bands of Indians, which

in the former region include closely related tribes of Canoe or Channel Indians who live almost entirely in small open boats of native design, constructed with considerable skill from large pieces of bark, either from the antarctic deciduous beech (*Fagus antarctica*) or from the evergreen beech (*F. betuloides*), sewn together with sinew or flexible whalebone. The latter is thrown up in considerable quantities along the shores of this coast. At present the Indians are usually clothed with bits of cheap calico fashioned into rude garments, that of the women resembling loose skirts suspended from the shoulders and usually extending somewhat below the knees. While for the most part the men and women are at present clothed with some sort of cloth, usually obtained by barter from the whites, yet examples are not entirely wanting of individuals still clinging, through choice or necessity, to that more primitive state in which a narrow girth about the loins is deemed sufficient, with sometimes the addition of a piece of seal skin held above by a single thong passing around the neck and over the shoulders, and below by another about the body, so that it may be readily shifted to any desired position according to the direction of the wind. These Indians feed almost exclusively upon shell-fish which they are able to pick up along the shore, while the remains of an occasional seal or sea-otter cast up by the waves, or the same animals taken alive with their spears, serve to vary their diet. Perhaps in no other people in the world are the actual necessities of life reduced to so few as among the Channel Indians of this region. With no constant habitation, they move about from one sheltered cove to another, so that their occupation of any particular place is entirely dependent upon, first, the abundance of the mollusks upon which they live, and, second (when these are well-nigh exhausted), upon the condition of the weather. On a few earthen sods in the bottom of their canoes they keep constantly burning a small fire, which always seems just on the point of going out; and over this they all bend when not engaged in collecting the animals for food, which they usually eat uncooked and without other preliminary preparation. For their shelter on land, notwithstanding the inclement weather that prevails almost continuously, they erect exceedingly inefficient and primitive structures consisting of only a few branches of trees, the lower ends of which are stuck in the ground in an almost complete circle, while the upper ends are carelessly thatched together, thus forming a sort of low, conical "wickiup" with an opening on one side. These,

together with their canoes, two small paddles with which the latter are propelled, one or two spears or harpoons made of bone for the capture of seals, and one or more rather well formed vessels made of rushes and usually of the capacity of about a gallon (used in gathering shell-fish), fulfill all their domestic requirements. Notwithstanding the exceedingly primitive manner in which they live, it is evident from the great accumulation of shell heaps in many places periodically occupied by them that they have inhabited this region for a considerable period, during which little if any alteration has taken place in their habits and customs.

TEHUELCHE BOY OF 16 YEARS

From a Photograph by J. B. Hatcher

The Indian tribes east of the Cordilleras are of Tehuelche or Araucanian stock, and in general appearance, habits, and customs they are quite different from and far superior to those of the western coast. Perhaps as a race no people in the world are better developed physically than are the Tehuelches of southern and eastern Patagonia. While their size has been considerably exaggerated by many of the earlier travelers, yet the fact remains that they are a large and physically well-developed race. The men have an average height of about five feet ten inches and the women of about five feet six inches. In both sexes the body is

well formed, and while the features are without doubt far less striking than are those of certain of our tribes of Indians, yet their countenances are usually such as to inspire confidence in their peaceful intentions and to allay feelings of uneasiness in the mind of the traveler who may be unwillingly thrown among them. In the construction of their "toldos" or tents they have advanced one step at least over that shown by many nomadic tribes living in North America or elsewhere, in that while having no permanent residences, they are nevertheless not entirely dependent upon the resources of the immediate vicinity in which they happen to locate for materials with which to construct their shelters, for they always carry with them a covering usually made of skins stitched firmly together in such a manner as to fit more or less precisely a framework of poles also carried for the purpose. With some tribes of North American Indians these easily transportable habitations are known as "tipis," the frame of which consists of a series of long poles arranged in a large circle at the base and meeting above, where they interlock in such manner as to afford mutual support, and on the outside of which the covering, formerly made of skins but now usually made of canvas, is stretched, thus forming a perfect cone when closed. In all such habitations among our North American Indians, so far as I am aware, this entire inclosure is unobstructed by partitions, and no attempt is made to divide the interior into separate compartments so as to afford a certain degree of privacy to individual members of the family.

The toldos or tents of the Tehuelches are each usually composed of the skins of about fifty adult guanacos sewed together in sections, which, when fitted together, are so designed as to form the top, one side, and both ends of a huge box, one side of which is much higher than the other and is left open. The framework of this box consists of three parallel rows of poles, forked above, planted in the ground at a distance of about four feet from each other in the direction of the length of the box and six feet in the opposite direction. The poles forming the first row or that on the open side of the toldo are usually about seven feet in height, in the next row, running through the middle of the interior, they are about five feet high, while three feet suffices for the series at the rear. In the forks of these uprights poles are laid, and over the whole the skin covering is stretched. These toldos are usually about twenty feet long by twelve feet in width. That portion of the interior between the two higher series of up-

rights may be considered as the living room, while in the rear small partitions extend from each of the posts in the third row to the opposite one in the middle row, thus dividing this space into a series of sleeping compartments from four to six feet in width, and sufficient to accommodate one or two persons. I think this condition of affairs should be regarded as a decided advance over that found in other tribes with transportable habitations, and that it has had a decidedly beneficial influence upon the social relations of the Tehuelches I do not doubt. That we have here represented three stages in that development which has

TEHUELCHE FAMILY AND TOLDO

From a Photograph by J. B. Hatcher

led up to the nineteenth century dwelling with all modern conveniences can hardly be doubted. Most primitive of the three is that of the Channel Indian, who once in each week or two throughout his entire life spends perhaps half an hour in gathering the branches to construct the rude "wickiup" which forms his ideal of a domestic habitation.

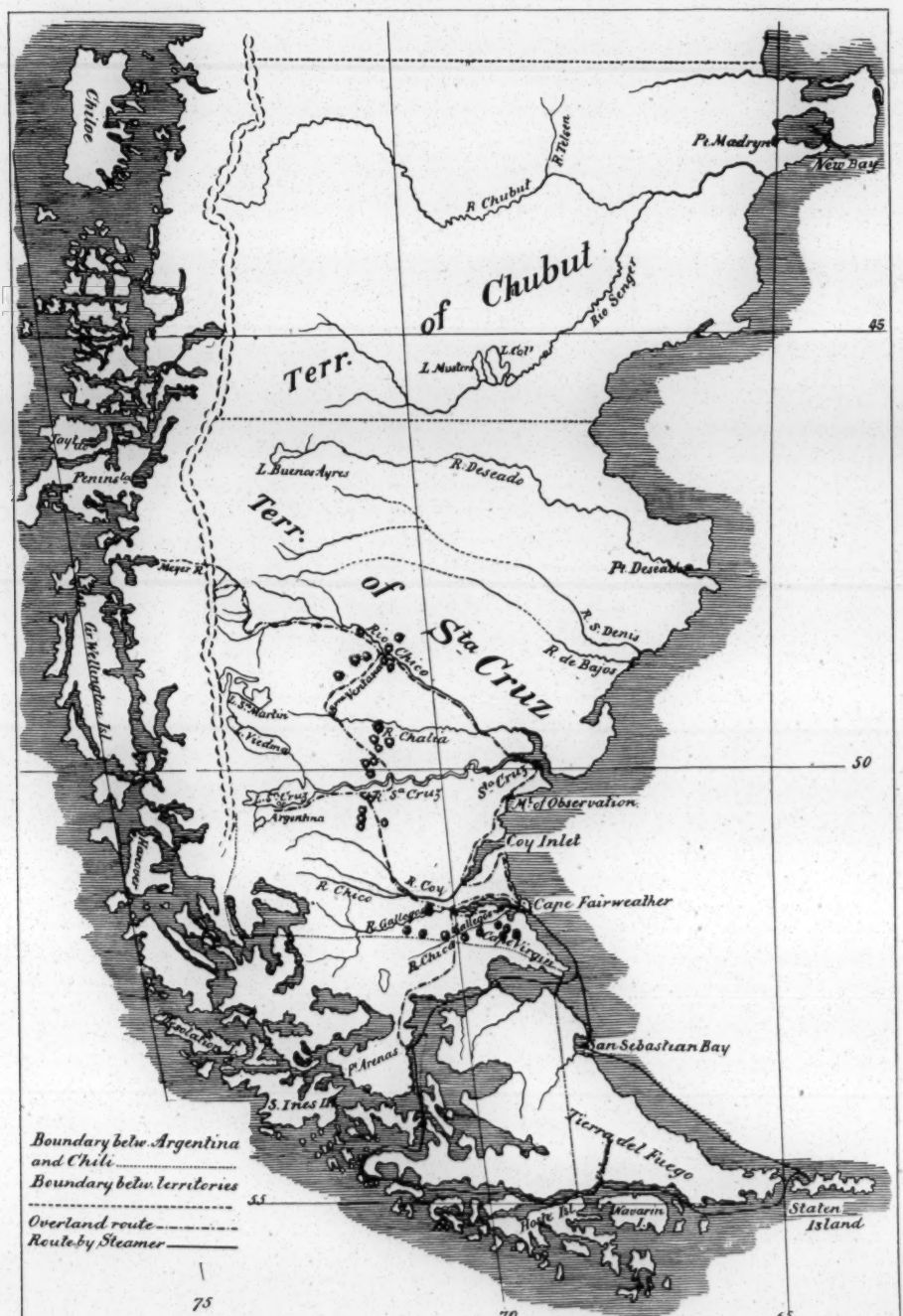
The Tehuelches of southern Patagonia are almost entirely unacquainted with the use of firearms, but they have an abundance of horses and dogs, by the aid of which, together with their bolle-

doros (bolas) they are able to capture guanacos and ostriches more than sufficient to supply them with food. From the skins of these, together with those of other animals, they construct the coverings for their toldos, make their clothing and bedding, and have sufficient left with which to manufacture the beautiful fur "capos" or mantles so highly prized by the Europeans. For the latter they consequently find a ready sale, from the proceeds of which they derive a revenue ample for the purchase of considerable quantities of "wachaki," which those better qualified than myself to judge consider as very bad whisky. Perhaps to some there will be a satisfaction in the reflection that "bad whisky, sooner or later, makes good Indians."

The surface of Patagonia is naturally divided by physiographic features into two regions—an eastern comparatively level plains region and an extremely mountainous western region. The latter extends in a narrow strip throughout the entire length of Patagonia and exhibits everywhere intensely rugged mountains, clad at their bases with luxuriant forests, while their summits are forever covered with great fields of snow and ice, which form glaciers often descending far below timber-line and constituting the sources of many of the numerous mountain torrents emptying into the Pacific, as well as most of the larger rivers of the eastern region, which after emerging from the mountains follow deeply eroded valleys in the plains and discharge their waters into the Atlantic.

Politically Patagonia is divided into essentially the same districts as physiographically. The western or mountainous region belongs to Chile and is mostly included in the territory of Magellan, with the seat of government at Punta Arenas. The eastern or plains region belongs to Argentina and consists of the territories of Santa Cruz, Chubut, Rio Negro, and a part of Neuquen.

To the absence of exact knowledge regarding the real physical features of this region is due the vexatious boundary dispute at present existing between Argentina and Chile. Formerly the loftier ranges of the Cordilleras were supposed to form the natural watershed of this entire region, and in the earlier boundary treaties negotiated between the two countries it was stated that a line connecting the highest peaks which divide the waters of the Pacific from those of the Atlantic should constitute the national boundary line. It has since been ascertained that in many instances, at least, streams flowing into the Pacific cut entirely through the Cordilleras, and in some cases have their

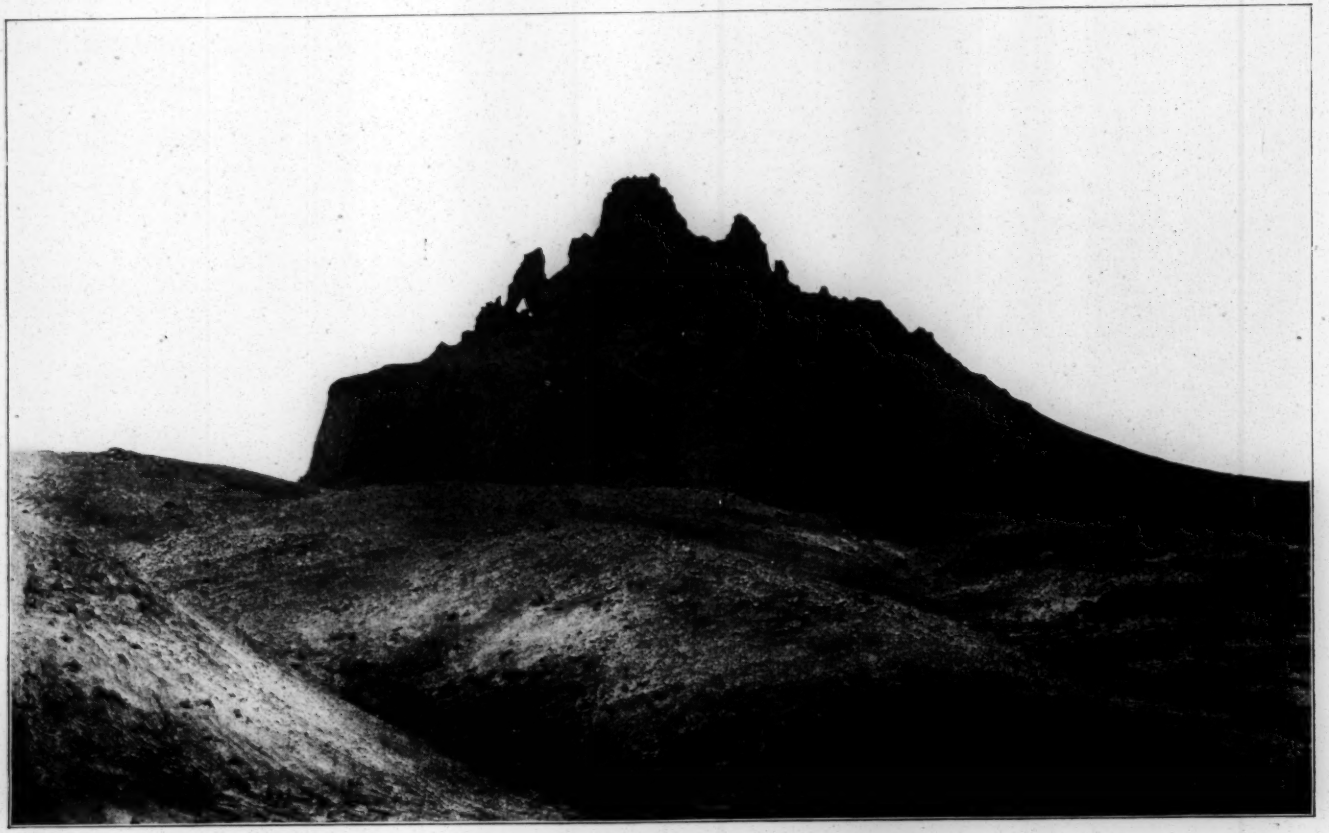


MAP OF PATAGONIA. ILLUSTRATING EXPLORATIONS OF J. B. HATCHER, 1896-'97

sources well out on the plains; so that, were former boundary treaties interpreted literally, much territory supposed to be of considerable value mineralogically and extensive tracts of rich grazing lands, all now held by Argentina, would revert to Chile. Not only has there never been any attempt at a topographic survey of the country, but throughout vast areas over the plains region of central Patagonia the watercourses as located on all the government and current charts are merely conjectural, while in the region between Lake San Martin and the territory of Neuquen no authentic map showing the locations of the principal streams flowing toward either the Atlantic or the Pacific has ever been attempted.

That part of this region which was visited and traversed by the writer and his assistant, Mr O. A. Peterson, during recent explorations in behalf of Princeton University and the Bureau of American Ethnology, and especially noticed in this paper, lies between the headwaters of Rio Chico and Rio Santa Cruz and the Strait of Magellan. The principal overland route will be found located on the map. From different points along this route shorter excursions were made in all directions.

The plains region of Patagonia may be considered as consisting of a series of benches or steps which appear as successive elevations on the surface as one proceeds from the Atlantic coast overland toward the Cordilleras. The precipitous bluffs of the coast, rising in places to a height of nearly five hundred feet, form the first step in the series, and from this the succeeding benches gradually increase in elevation until along the base of the mountains an altitude, according to Darwin, of 3,000 feet is attained. The escarpments constituting the limits of each of these succeeding benches form irregular but somewhat parallel lines, which conform not only to the general direction of the present coast-line, but also to the courses of the great transverse valleys at the bottom of which flow the larger rivers of eastern Patagonia. This series of benches or steps may be seen not only as one proceeds from the coast toward the interior of Patagonia, but also on either the one or the other side, sometimes on both, of all the greater watercourses of this region distant from the coast and near the mountains. They doubtless represent succeeding bluffs formed along the coast, and mark successive stages in the final elevation of this region which took place toward the close of the Pliocene period. The occurrence of this series of benches along the sides of the river valleys of this region is



SIERRA VENTANA, SOUTH SIDE OF RIO CHICO DE SANTA CRUZ, PATAGONIA

From a Photograph by J. B. Hatcher

additional evidence in favor of my view* that the great transverse valleys of Patagonia were in existence prior to the last submergence of this region in the Pliocene, and during which submergence the marine Cape Fairweather beds were deposited. During the elevation that caused the close of this submergence there was distributed over this region the great Bowlder or Shingle formation (Tehuelche formation of Ameghino) of Patagonia. These benches along the watercourses are not merely river terraces formed of alluvial materials, but are composed of the original strata constituting the Santa Cruz, Supra-Patagonian, and Patagonian beds, as shown in numerous exposures. They are often many miles in width, and I think show conclusively that throughout certain periods during the elevation of this region these valleys formed deep embayments into which extended the waters of the Atlantic. Some of the more important of these valleys may even have formed straits connecting the Pacific and Atlantic oceans, as has been claimed by Darwin.

Another prominent feature over the Patagonian plains is the occurrence of numerous volcanic cones, appearing usually in groups and at places remote from the Cordilleras. These craters, although now extinct, have been active during comparatively recent times, as is evidenced by the numerous small lava streams to be found in many places, and which are seen to have flowed directly from some one of these craters down over the sides and into the valleys of the present smaller watercourses, where they have adapted themselves to the curves of the valleys and the inequalities in the surface of the bottoms of the latter, and do not extend into strata forming the sides of the valleys. Such lava streams of comparatively recent origin always present an irregular, hummocky surface, with numerous caverns, and are composed almost always of very vesicular material. A splendid example of such a lava stream may be seen in a small cañon on the southern side of the Rio Chico of the Gallegos river about two miles below Palli Aike, near the point where the present national boundary line crosses the Chico. Probably these small volcanoes were active throughout a considerable period in Tertiary times, and largely furnished the materials of the Santa Cruz beds. That they were active during the depositions of the Santa Cruz beds is evidenced by the occurrence of lavas included between successive strata of those beds, which, owing to the absence of disturbance in the latter, can hardly be considered as intrusive.

*See "On the Geology of Southern Patagonia," Am. Jour. Sci., Nov., 1897, pp. 327-354.

These extinct volcanoes are scattered over the plains in a not entirely irregular manner. As before stated, they occur in groups, there being usually from three or four to as many as a dozen in each group within a radius of perhaps five miles. These crater areas occur at irregular intervals on the plains of Patagonia from near Cape Virgin at the eastern entrance to the Strait of Magellan to as far north as the country visited by us, at least, and most likely for a considerably greater distance. For the most part, they are found over an area extending parallel with the Cordilleras and distant from eighty to one hundred and twenty miles from them. In places they rise but a few feet above the surface of the surrounding country, and some of these may not be craters, but simply elevations in the surface of the lava due to a heaping up of the materials resulting from the intersection of two or more streams while flowing. In many cases they rise several hundred feet above the surrounding country, have immense craters or bowls on their summits, and present unmistakable evidences of having been active volcanoes within comparatively recent times.

Whether these craters should be considered as lateral cones dependent upon the greater volcanoes of the Cordilleras and as having derived their molten materials from the same reservoir, or as an independent system the materials of which were derived from a distinct reservoir, it is difficult to say. From the similarity of the basalts known to occur in the two regions, however, I should be inclined to the former view. Between this series of volcanoes and the Cordilleras, especially in the region lying south of Santa Cruz river, there are wide, open plains, entirely unobstructed by either extinct volcanoes or lava fields.

Another interesting feature prominent in the topography of Patagonia, especially in that part of the country lying east of the crater region, is the occurrence of numerous shallow salt lagoons at the bottoms of great depressions, or rather excavations, from 100 to 300 feet or more in depth, scattered over the surface of the plains. I have described these lakes and discussed their origin in a previous paper already cited on the geology of the region.

At a distance of ten or twenty miles from the Cordilleras the shingle or bowlder formation increases greatly in thickness and is composed of much coarser materials. Near the base of the mountains the materials constituting this formation are not distributed in a uniform manner over the surface, so that the latter loses its level, plain-like appearance, and presents numerous small, rounded hillocks composed of heterogeneous masses of

angular stones, rounded bowlders, and finer clays and sands. These materials were evidently deposited as terminal moraines in late Pliocene or early Quaternary times. Such deposits are especially noticeable in all the larger valleys near the Cordilleras, where they are frequently of great thickness, and, left as barriers by the receding glaciers, they now aid in confining considerable bodies of fresh water, which as lakes extend in a more or less continuous chain all along the base of the mountains. Among the more important of these are lakes Argentina, Viedma, San Martin, and Buenos Aires. All these lakes extend far back into

MOUNT LEVIATHAN: SOUTH COAST OF TIERRA DEL FUEGO

From a Photograph by J. B. Hatcher

the otherwise almost inaccessible recesses of the Cordilleras, where they are fed by numerous glaciers. None of the lakes have been thoroughly explored and mapped, and their exact size and shape are as yet undetermined.

There are no more rugged mountains anywhere in the world than are the Cordilleras of Patagonia. They rise directly from the plains on the east and the sea on the west to a height in some places of more than 10,000 feet, and present myriads of inaccessible peaks without so much as a single practicable pass, so

far as has yet been discovered, for more than a thousand miles. On the west they are invaded by a labyrinth of bays, channels, sounds, and inland watercourses which for beauty and intricacy are unsurpassed and probably unequaled on any other coast.

The intensely rugged nature of these mountains and of the Pacific coast is doubtless largely due to the comparatively recent age of the former, for from the highly inclined position of the Miocene strata (Supra-Patagonian beds) all along the eastern base of the mountains it is evident that while the actual birth of the latter may have taken place during Mesozoic times, yet their greatest development was not accomplished until the Miocene, and hence they now present numerous sharp peaks, bold lines, and rigid angles, which the eroding elements in nature have not yet had sufficient time to soften; yet it cannot be said that they do not harmonize well with their surroundings, for only that which is rugged in the extreme could comport with the perpetual storms which forever rage about the summits and the terrific onslaughts of waves that constantly attack the bases. Nature always produces most perfect harmony; and as these lofty peaks are lowered and their sharp angles rounded by erosion, just so will the causes of the truly terrible storms that now prevail here be removed and equally harmonious conditions preserved, perhaps even more pleasing, if not so startling, increasing in beauty, like the splendid canvas or mural painting, as the brighter and more vivid colors are gradually softened with age.

According to its flora, Patagonia may be divided into three regions, characterized not so much by differences in species represented (for one of these regions may be fairly considered as furnishing all the species of plants found in the other two) as by the quantity and quality of the vegetation. The first of these may be designated as the eastern coast region, and consists of a narrow belt of fairly good grazing lands, extending along the coast from the Strait of Magellan to Port Desire. All the available land is here taken up by sheep farmers, mostly from the Falkland islands and Scotland, with a few English, Germans, French, Spaniards, and native Argentinians and Chilinos. The second region consists of almost barren high pampas and usually equally barren river valleys. It extends from the western border of the first region to the base of the Cordilleras, and is entirely uninhabited, so that while the vegetation is indeed exceedingly scanty it nevertheless suffices for the support of considerable bands of the guanaco and the rhea, the so-called ostrich of South

GUER AIKE: A PATAGONIAN SHEEP FARM — TYPICAL VIEW OF THE PAMPAS

From a Photograph by J. B. Hatcher

America. The third region is that of the Cordilleras, and is far richer than the other two, both as to species and in the total amount of vegetation.

Throughout the first two regions trees are unknown, the vegetation consisting entirely of grasses, herbs, and a few small shrubs, never attaining a height of more than a few feet. Among the more common of these shrubs are two small resinous evergreens with a decided odor of pitch. They belong to different families, and are distinguished by the inhabitants according to the color of the foliage as "mate verde" and "mate negra;" they form the "South American tea," which is largely used in Patagonia and elsewhere. A species of *Berberis* ("Calafate") with bright yellow flowers and dark-purple, rather tart, edible fruit is common everywhere, while along the watercourses far in the interior the incense bush and a species of leguminous shrub, often attaining a height of five or six feet, are not uncommon. The dead trunks and branches of these shrubs provide sufficient fuel for the traveler in Patagonia.

In the Cordilleras forests abound, consisting for the most part of two species of beech (*Fagus antarctica* and *F. betuloides*), the winter's bark (*Drimys winteri*), and toward the north a few species of conifers. On the eastern slopes of the mountains the vegetation is not nearly so varied as on the western, and in many places over vast areas only one species of tree is to be found, viz., *Fagus antarctica*, the deciduous beech. This condition prevails especially about the headwaters of Rio Chico and Rio Santa Cruz, and on all the upper tributaries of Mayer river, a stream of no mean size which we discovered in this region flowing to the Pacific, and named in honor of General Edelmiro Mayer, the late governor of the territory of Santa Cruz.

Throughout all the forests of the Cordilleras mosses, hepaticas, ferns, and lichens occur in the greatest profusion. The stones, trunks of fallen trees, the bases of those still standing, and even the ground itself, are often covered to a depth of several inches with these plants, forming a soft carpet of rich colors exceedingly pleasing to the eye, and surpassing in beauty any exhibition of foliage plants, if I may so call them, that I have ever seen.

The faunas of the plains and mountain regions differ more widely than do the floras, for in each are found species wanting in the other. The most striking and most abundant mammals met with over the plains are the guanaco (*Auchenia huanacus*) and two species of dogs, sometimes erroneously called foxes

(*Canis azaræ* and *C. magellanicus*). The former species is much the smaller, is of a light gray color with a black spot at the base of the tail, and is quite tame and exceedingly common everywhere on the plains. The second and much larger species is rather shy, and is found only in the mountains. The puma or mountain lion (*Felis concolor*) is abundant, while a smaller cat, perhaps some species of lynx, is not uncommon. A small skunk (*Mephitis patagonica*) was formerly abundant, but a few years since they were almost exterminated in one winter over a large area along the southern coast by some disease, apparently contagious, among them. Their skulls and skeletons are now to be picked up in great numbers, and occasionally a live specimen is still met with. Only one species of armadillo is at all common in the region visited by us, and it does not extend south of Santa Cruz river. Deer are absent on the plains, but one species is fairly abundant in the mountains. It is about the size of our Virginia deer, of a rich dark-gold color, the males armed with a pair of two-pronged horns. I killed about fifteen of these animals and saw several others, but never observed one with more than two points on each horn. We nowhere observed the larger species of deer said to be abundant in the Cordilleras farther northward.

Rodents are extremely abundant, especially in the valleys and along the bluffs of the rivers and smaller streams in the vicinity of the mountains, where the entire earth for a depth of nearly two feet is literally undermined over areas of many square miles in extent, with subterranean passages which greatly impede the traveler, whose horse drops in at every step half-way to the knee. In some regions so abundant are these burrowing rodents, especially in the sides of the bluffs, that they become real and not inconsiderable agents of erosion. That they have aided considerably in producing many of the present topographic features I do not in the least doubt, not so much by the actual removal of material as by the production of a condition throughout the surface of the soil and rock such as to render it more easy of being removed by recurring rains. Among those rodents contributing most to the facility with which the bluffs are here being eroded are various species of mice, and especially two species of *Ctenomys*, whose ability and propensity for burrowing can scarcely be overestimated. Formerly rodents were very abundant all along the coast, but since the introduction of sheep some ten years ago they have disappeared almost entirely from the coast region, and the larger species are now rarely seen there.

There is a considerable variety of birds in Patagonia. Waterfowl are especially abundant, as are also birds of prey. I presume that the number of hawks and vultures is scarcely exceeded in any district of equal area elsewhere in the world. Several species of plover, grouse, and snipe are to be found on the pampas, while thrushes, wrens, and sparrows are well represented. Condors are plentiful, not only in the Cordilleras, but also along the more precipitous river bluffs and in the lofty "barrancas" of the coast of the Atlantic as far northward as Port Desire. The rhea, or so-called ostrich, is abundant on the plains, and is occasionally met with in the mountains. Beautifully colored red and black flamingoes and swans are among the more striking inland wading and swimming birds. In the Cordilleras a small green paroquet is very abundant. Several species of fly-catchers are plentiful, while two woodpeckers and two or three thrushes are common. A jacksnipe occurs about the open streams and parks, and five species of owl were taken.

Of fresh-water fishes there does not appear to be a great variety, but we succeeded in finding some of the streams fairly well stocked with two or three species of splendid edible varieties. Sand lizards are seen in great numbers, and present many different colors and vary considerably in shape, especially in the length of the tail. Frogs are present, though rare, but we never saw a snake of any description. Of insects, the Coleoptera seemed best represented. Butterflies were represented by but few species, those usually of the less conspicuous varieties. Dragon-flies are rare. There are considerable varieties of ants, but bees, wasps, and other Hymenoptera are not abundant.

HATCHER'S WORK IN PATAGONIA

On February 29, 1896, Mr J. B. Hatcher, of Princeton, embarked for Buenos Aires, primarily to collect vertebrate fossils and recent organisms in Patagonia for Princeton University, incidentally to obtain photographs and other data pertaining to the aborigines for the Bureau of American Ethnology. He bore letters from both institutions, those from the latter securing him official recognition in Argentina; and during his stay he received every courtesy, as well as most material assistance, from the government of this rapidly growing republic. The success of his work was largely due to these official facilities and to the good

offices of ex-Minister Estanislao Zeballos, one of the few honorary members of the National Geographic Society.

From Buenos Aires Mr Hatcher proceeded to Gallegos, the seat of government of the province of Santa Cruz, a future empire of half the area of all Germany, with a population of only about 1,600, including 300 Indians. Outfitting here with a light tent, five horses, and a small cart, Mr Hatcher, accompanied by a single assistant (Mr O. A. Peterson, of Princeton), traversed the coast to Punta Arenas, making extensive collections in paleontology and natural history. Punta Arenas, long an unimportant station, became the center of immigration a few years ago in consequence of discoveries of gold; it is now the capital of the Chilean territory of Magellan, with a population of about 3,400; the entire territory supports a population of some 6,000, including about 800 Indians. Returning to Gallegos, Mr Hatcher and his companion set out toward the Cordillera (or southern Andes) on December 1, 1896, and from that date until April 6, 1897, they saw no human beings save themselves. They journeyed first westward and then northwestward to Rio Santa Cruz, one of the principal rivers of Patagonia. Finding this too large for fording, they followed its banks to the great body of fresh water (Lake Argentina) in which it heads; there they were so fortunate as to find a boat, abandoned by English explorers several years before, which they appropriated and repaired, and in which they ferried their cart and baggage over the stream, swimming their horses behind. Journeying northward near the base of the Cordillera, they discovered, among other new geographic features, a river fully equal to the Santa Cruz in volume, occupying a most unexpected position. It heads in the pampas east of the Cordillera, but flows westward through a profound gorge and undoubtedly falls into the Pacific at some undetermined portion of the rugged Chilean coast. It is fed by glaciers, often of noble magnitude; it is swift and tumultuous, so that it was found impracticable to cross it, or indeed to trace its course, with the facilities at command, more than a part of the way through the cañon in which it traverses the Cordillera. Several weeks were spent in work about this portion of the Cordilleran front. They were not without the incidents common to exploration of uninhabited countries. Sometimes these were of serious character. In one case Mr Hatcher, while separated from his companion, was accidentally struck on the head by the metallic bit of his horse's bridle and so seriously wounded that the horse escaped, leaving him alone and helpless

on the pampas for two days and two nights. He recovered sufficiently to rejoin his companion, but the wound and exposure produced erysipelas, by which he was incapacitated for weeks. The difficulty of travel was greatly enhanced by the nearly uniform foulness of the weather; cold, drizzling rains and dense fogs are characteristic of Patagonia, with temperature but little above the freezing point for months at a time. Fortunately game was easily taken, and supplied the chief part of the camp fare.

Returning from the trip into the interior, Mr Hatcher, with his companion, made a voyage through the Strait of Magellan and about Tierra del Fuego, in the course of which many new observations were made on the natural history, geology, paleontology, and ethnology of the region. The various routes traversed are indicated on Mr Hatcher's map, through which an idea of the extent of the journeys may be gained. He returned to Princeton in July, 1897.

As indicated by his article, Mr Hatcher's energies were by no means limited to the collection of specimens; indeed, he utilized his opportunities for geographic, geologic, and ethnologic study in a notably successful manner. The geographic results are stated summarily, though with excess of modesty, in the paragraphs prepared for this magazine, while the preliminary results of the geologic and paleontologic researches appear in several articles in the *American Journal of Science* and the *American Geologist*.

Certain features of southern South America brought out through Mr Hatcher's observations are especially significant to students of geographic development. One of the characteristics of the region is the dearth of soil; another is the paucity of the flora, both in individuals and species, and the fact that the flora of the pampas is evidently derived from that of the Cordillera; still another is the presence of saline lakes, of residuary character, scattered over the pampas. These features indicate conclusively that the Patagonian pampas have but recently been raised from ocean bottom to form dry land. Certain other features give hardly less decisive indication of the manner of lifting. The Pacific coast passes from a lofty archipelago into a fiord-marked sierra, the configuration, on the whole, suggesting recent subsidence; the great Cordillera is trenched by the gorges of rivers (notably the newly discovered Rio Mayer), which have evidently retrogressed through the range so completely that water-parting and mountain-crest no longer coincide; while there is a line of

fresh-water lakes skirting the eastern mountain front, which, albeit perhaps partly held in place by morainic dams, undoubtedly owe their preservation to the sluggishness of the rivers flowing toward the Atlantic—and all these features, as well as some others, indicate that the lifting was greater along the eastern margin of the continent, so as to produce a general warping or westward tilting. The history of the evolution of this continental terminus has been complex, as shown by the geologic succession brought out through Mr Hatcher's observations; there have been several oscillations of greater or less extent; doubtless at times the Patagonian Cordillera formed a great archipelago like the present Tierra del Fuego, and the course of Mayer river may have been a strait like the present Magellan; yet the minor episodes but combined to make up the general history of uplifting and westward tilting.

Mr Hatcher has just sailed for Punta Arenas to continue his explorations and surveys. W J M.

THE SUSHITNA RIVER, ALASKA

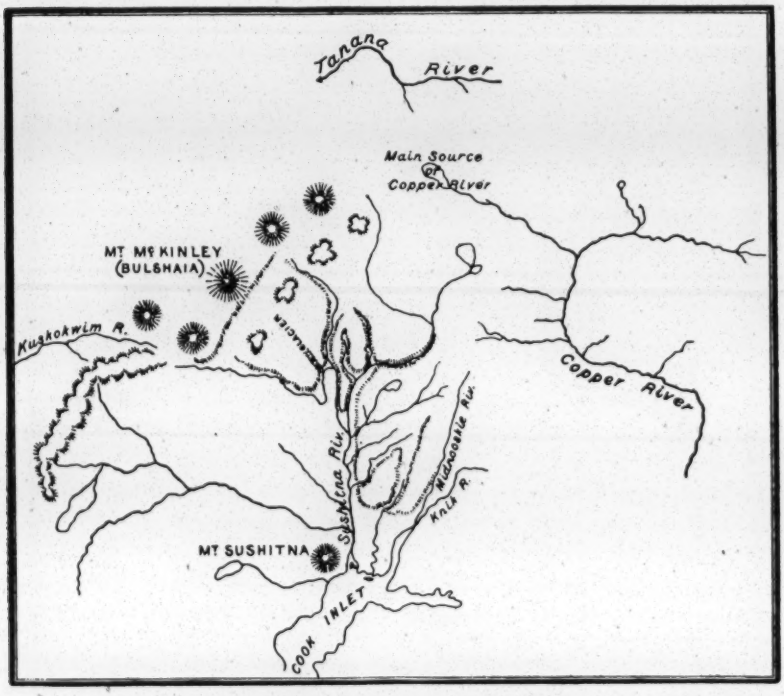
By W. A. Dickey

The Sushitna,* though an almost unknown river, is one of the largest in Alaska, carrying more water than Copper river, though the latter is somewhat longer. It has a delta at its mouth, beyond which extensive mud flats reach far out into Cook inlet. The river is divided into many channels and spread out over the mud flats, rendering steamboat navigation difficult. The tides at this point in Cook inlet rise over 30 feet, yet, notwithstanding this great rise, they have but little effect in checking the swift current of the river, so little as to be unnoticeable a few miles up the stream. The tide flats surrounding the mouth are bare at low water for a distance of nearly ten miles, and are very dangerous to pass. In the treacherous glacial mud a rowboat is liable to sink, and to be held so firmly that the incoming tide, which rises with incredible rapidity, will fail to float it.

The mouth of the river is nearly opposite Turnagain arm, a branch of Cook inlet, which is a great breeder of storms. It is therefore exposed to sudden squalls, which may catch the unfortunate boatman where there is neither landing place nor shelter.

*Sushitna means the great muddy river, and is descriptive.

We had an especially unpleasant experience this spring, spending a cold night in April on these flats, unable to enter the river or to approach near to the mouth, being prevented by great fields of anchor ice, which extended more than a mile from any camping place on shore. About 15 miles up the river the first land above overflow is reached, a tangle of willows and cottonwood giving place to the customary upland growth of the country, which consists of scattered groves of spruce and birch.



MAP OF THE SUSHITNA RIVER, ALASKA

An idea of the volume of water the river carries can be had from its size near the trading station, which is some miles above the influence of tide. Just above the station the river, for the first time hemmed into a single channel, cuts through a rock dyke which crosses its valley diagonally. Here the stream is 1,200 yards in width and is very deep and swift, soundings indicating a depth of over 100 feet. Immediately above this rock dyke the river forks, and it is impossible to tell from the appearance of the two streams which carries the more water, although

the northern branch is generally called the main river, and is the one which we ascended.

The Kuskokwim Indians come down the western branch to trade. They say there is an easy passage from the Kuskokwim into this branch of the Sushitna, which would indicate a low range of mountains as forming the watershed between these two valleys, instead of the high, unbroken range indicated on the government charts of previous years.

If this so-called Alaskan range exists, it must be much farther west than is indicated on the charts, for I have been where I could see at least 100 miles west of Sushitna river, and could see no indications of such a range in that direction. A vast, almost level country, covered with forests of spruce and birch, with here and there great swamps, extended to the west as far as I could see with a rather poor pair of field-glasses. It is true that early in June (1897) I could see patches of snow to the west, which would indicate the presence of mountains, but they are not at all high, as in the previous year the snow was all gone in July. The Indians report a large lake on this western branch, and say that the stream forks six days' journey from its mouth.

The other branch has a generally northern direction, though very crooked. Only once in 100 miles above the junction is the river confined to a single channel, and there only where hemmed in by high bluffs on both sides. Many islands and channels, great masses of driftwood, and countless snags characterize this portion of the river, while caving banks, falling trees, and the swift current make the journey both difficult and dangerous. Nowhere could we make any headway except by poling or towing, crossing and recrossing the labyrinth of channels to escape dangerous places. One-third of the boats that have ascended the Sushitna any distance have been lost, either by being swept under the drift and sunk or smashed by caving banks or falling trees. Luckily, however, only one life was lost during the last season, that of a Mr Parsons, of Seattle.

The low mountains that lie between the Midnooskie (Knik) and the Sushitna rivers were apparently about 12 to 20 miles back from the river, and three small branches enter the Sushitna from that side.

While ascending this portion of the river we had many glorious views of Mt McKinley and an unnamed companion southwest of the higher peak. Mt McKinley is in this valley as ubiquitous as the Washington monument in the city of Wash-

ington. Everywhere you go in clear weather you can see its glorious summit dominating the northern landscape. There is no question in my mind that it is a very high peak, as we could see three distinct ranges of mountains between our point of observation and its camel-hump summit, which towered thousands of feet above all the other mountains. Two of the three ranges are covered with eternal snow and must be of considerable altitude, though appearing low in comparison with lofty McKinley.

The last range in front of this great peak is very broken and irregular. We could see cliffs that showed fronts of several thousand feet of perpendicular walls, and on all sides were glaciers and snowfields. I have talked with about thirty persons who have seen this great peak from the Sushitna valley in the past two seasons, and they all agree that it is the highest mountain they have ever seen. One party, who had been in the vicinity of the St Elias range, thought it looked higher than any of the mountains of that group.

The Indians of Cook inlet have always called this the Bulshaia (great) mountain, it so manifestly dominates all the other mountains in that portion of Alaska. It appears to me higher than any of the peaks of the Fairweather group, near which we were becalmed on a clear day on our return voyage.

I had also a chance to compare its height and distance with that of Mt Iliamna one clear day when we were camped on an island at the mouth of the river. Field-glasses brought out the detail on Mt Iliamna, but made no change in the cloud-like appearance of Mt McKinley. Iliamna is 12,096 feet high, and was, according to the government chart, 100 miles distant from our point of observation. Notwithstanding its greater distance, Mt McKinley showed a greater angle of elevation above the horizon, and is certainly a much higher mountain. There are four high peaks in the cluster about Mt McKinley, all unnamed at present.

About 90 miles above the lower forks the river again branches into three large streams. The western fork seems to occupy the main valley, though I am of the opinion that the middle fork is the longer and at certain seasons of the year carries the most water. In the hot days of June, July, and August the western branch, fed by the great snowfields and glaciers of the ranges about Mt McKinley, is a roaring torrent, a flowing sea of mud, so much earthy matter does it carry in solution. Parties who have ascended this branch say that about 60 miles up it forks into two nearly equal streams. The southwestern branch they

followed a long distance, and found it ran all the way in the low, flat country skirting the foothills of the great range. They ascended a hill, and far to the west could see what they took to be the headwaters of the Kuskokwim, or some other stream, flowing in the opposite direction, with no marked divide between the two rivers.

The branch we followed was the middle fork, which soon entered a narrow valley between low hills, which gradually became higher and higher until we came to a cañon about 60 miles above the forks, through which it was impossible to take our boats. We had supposed from what we could gather from the Indians that there was a waterfall in the cañon, but such does not seem to be the case, though for a distance of about a mile there are very rough rapids in which no boat could live. The walls of the cañon are nearly 1,000 feet high, and in some places are perpendicular. The water, confined in a very narrow channel, looks like a white ribbon at the base of the great walls. We ascended the mountains on both sides and obtained splendid views of the great cluster of peaks about Mt McKinley, which bore a little north of west.

The Copper River, or Midnooskie, Indians, who inhabit the upper waters of the river, all agree that the main source of Copper river is near the headwaters of this branch of the Sushitna and not far from the Tanana. As the government charts place the main source of Copper river north of the Wrangel group of mountains, I have carefully looked up Lieut. Allen's report, and find that his narrative would agree with the statement of the Indians. When Lieut. Allen reached the mouth of the Chitsletchnia river he was in doubt as to which was the main river, as the forks were apparently nearly equal in size. He followed the branch now known as the main river, not because it was the larger, but because he was informed that nearby there were Indians living on it from whom he could obtain food, of which his party were in sore need. He goes on to say that the stream diminished in size rapidly as he ascended it, and soon became less than 100 yards in width. The main source is, probably, as indicated by the Indians, south of the Tanana and near the Sushitna. Lieut. Allen, in his report, falls into the error of confusing the Sushitna with the Midnooskie or Knik river, down which the Midnooskie Indians from the Copper river come each year to trade at the Knik station. They ascend the Tazlina branch of Copper river, cross a low divide, and come down the Midnooskie instead of the Sushitna, as Lieut. Allen erroneously conjectured. The

Tanana Indians last winter came down the Sushitna to trade. They are a very warlike tribe and are accused by the Midnooskies of being cannibals.

The interior of the country has but little game. For many days we saw not a living animal except birds, and but few fish, though salmon run in August and candle-fish in June. We saw more bear than any other large game, but did not kill any. There are colors of fine gold everywhere, but we found no coarse gold, and the signs of gold diminished upstream.

A WINTER WEATHER RECORD FROM THE KLONDIKE REGION

By E. W. Nelson,

Biological Survey, U. S. Department of Agriculture

During the years 1880 and 1881 the Alaska Commercial Company had a fur-trading station on the upper Yukon, in British territory, at no great distance below the mouth of the Klondike, where Dawson City is now located. This station was called Fort Reliance, and was in charge of Mr L. N. McQuesten. It was afterward abandoned and is now in ruins. Mr McQuesten was one of the original prospectors in this region, and his discoveries led to the founding of Circle City and indirectly to the marvelous development that is now taking place in that region. When Mr McQuesten came to St Michael in the spring of 1880 with his winter's gathering of furs I gave him a Signal Service standard minimum thermometer, and he undertook to make a series of daily observations for me at Fort Reliance during his stay there in the fall and winter of 1880–'81. When he returned to St Michael in the spring of 1881 he brought me the subjoined record. It covers the period from the early fall to the opening of navigation on the upper Yukon in spring, and is of peculiar interest at present as showing some of the meteorologic conditions in the area which is now attracting world-wide attention on account of the unprecedented richness of its recently discovered placer mines. It is in this district that some thousands of men are wintering with a reported scarcity of provisions that may result in appalling suffering before navigation opens in spring.

It will be noted in the record that the Yukon froze over during the night of November 2. On the 14th of the following May the

ice first started on the river and ran for an hour and then stopped. From this it will be noted that the river was covered with a practically unbroken sheet of ice for a little over six months. On May 17, at 4 a. m., the ice began running again, and was still plentiful on the 19th, but was nearly gone on the 20th. The final entry of this interesting record, made on May 23, is as follows: "Start for St Michael tomorrow."

During my residence at St Michael, from June, 1877, to June, 1881, I learned from the Yukon traders that the ice breaks first in the upper river, and the general breaking up proceeds thence down to the delta, several days intervening between the opening of navigation above and the clearing of the great river below. The fur traders of the upper Yukon usually started as soon as the river became pretty well freed from floating ice, and were joined on their way by the traders stationed lower down. The little flotilla of barges usually reached the river mouth at about the same time. By this time the river delta would be free, and if the sea ice had opened out from shore the boats would proceed northward along the coast to St Michael, 60 miles away. The date for the ice to break away from the coast between the Yukon mouth and St Michael varies greatly and may occur at any time between May 31 and July 1. It usually takes place before June 10. The river boats frequently arrived at St Michael before it was possible for vessels to pass the barrier of pack-ice offshore.

In Mr McQuesten's record the first wild geese were noted on March 31. This is a month before they used to appear along the coast and is a good indication of the more rapid advance of spring on the upper river.

The following summary of these observations brings out some interesting points, but it is probably not ordinarily the case that January should be warmer than either December or February, as it was that season. Commencing with the long nights that come on in October, the temperature sank steadily, and in December was noted the greatest cold of the winter (—67° on the 20th). In January occurred a strange and prolonged upward oscillation of the temperature that probably does not generally occur. Following this during February there was another period of intense cold, which lasted until March 1. In this latter month the effect of the returning sun became strikingly evident. The widest range of temperature in any month (88°) was during March. The thermometer used was a Fahrenheit.

Monthly Summary of Observations of Temperature, Fort Reliance, N. W. T., Winter of 1880–'81

Month.	Highest.	Lowest.	Monthly means.			
			7 a. m.	12 m.	6 p. m.	10 p. m.
1880.						
September*	53	20	34	46.7	43.7	36.9
October	42	— 10	10.5	25.3	21	17.1
November	40	— 27	4.9	12.2	10	8.6
December	8	— 67	— 34.6	— 29.3	— 29.4	— 30.2
1881.						
January	22	— 41	— 9.1	— 5.5	— 5.4	— 6.6
February	— 2	— 58	— 37.8	— 22.2	— 26.3	— 30.2
March	45	— 43	— 5.5	12.3	10	4.3
April	50	8	24.9	42.2	39.9	32.4
May†	58	10	32.5	45.3	42.4	35.9

* Beginning September 4. † Ending May 23.

RECORD OF DAILY OBSERVATIONS

Date.	Lowest.	7 a. m.	12 m.	6 p. m.	10 p. m.	Wind.	Remarks.
1880.							
Sept. 4	24	30	49	48	35	S. E.	Cloudy.
5	22	28	50	49	38	N. E.	Clear.
6	36	38	50	49	40	N. E.	Clear.
7	34	38	45	40	35	N. W.	Fair.
8	32	48	50	45	40	N. W.	Fair.
9	31	36	46	42	39	W.	Cloudy.
10	23	28	49	45	37	N. W.	Clear.
11	24	35	52	48	37	S. W.	Clear.
12	36	48	48	45	40	N. W.	Cloudy.
13	33	37	47	40	33	N.	Clear.
14	29	33	44	36	30	N.	Clear.
15	28	33	53	50	38	S. E.	Light clouds.
16	29	35	52	49	40	S. E.	Light clouds.
17	24	28	50	45	35	S. E.	Clear.
18	29	34	45	43	32	S. E.	Clear.
19	28	32	50	48	38	S.	Clear.
20	25	30	49	46	37	S. E.	Light clouds.
21	25	33	46	43	40	N. W.	Cloudy; rained in the afternoon.
22	26	30	44	42	36	N.	Clear.
23	26	34	50	48	42	S.	Cloudy.
24	40	42	51	47	43	S	Cloudy.
25	32	35	44	42	40	S. W.	Cloudy; rained all day.

Date.	Lowest.	7 a. m.	12 m.	6 p. m.	10 p. m.	Wind.	Remarks.
1880.							
Sept. 26	32	34	43	40	38	N. W.....	Clear.
27	24	28	40	35	34	N.....	Clear.
28	20	25	34	38	35	N. W.....	Cloudy; rained all day.
29	32	35	40	39	34	S. E.....	Light clouds.
30	28	31	42	38	30	E.....	Clear.
Oct. 1	27	30	40	38	35	E.....	Clear; cloudy in the evening.
2	27	33	42	39	36	S. E.....	Clear; cloudy; rained in the afternoon.
3	24	28	40	38	30	E.....	Clear.
4	19	21	36	34	24	Calm.....	Clear.
5	18	21	37	30	24	Calm.....	Clear.
6	19	23	40	35	33	N. W.....	Light clouds.
7	25	29	39	36	34	N. W.....	Light clouds.
8	12	15	30	27	24	Calm.....	Clear.
9	10	14	33	32	30	N. W.....	Clear.
10	28	33	40	38	35	N. W.....	Cloudy; showery.
11	30	32	39	35	30	N. E.....	Clear.
12	11	14	27	30	28	Calm.....	Clear.
13	20	22	(?)	25	22	N.....	Clear.
14	8	12	25	15	8	Calm.....	Clear.
15	2	4	18	12	9	Calm.....	Clear.
16	7	18	25	23	23	N. W.....	Cloudy; snowed all day.
17	12	15	26	20	14	W.....	Light clouds.
18	10	13	29	20	17	W.....	Light clouds.
19	11	15	30	22	16	W.....	Light clouds.
20	14	18	25	20	17	N. W.....	Cloudy; snow showers all day.
21	— 6	— 2	12	— 1	— 6	Calm.....	Clear.
22	— 7	1	13	— 3	— 6	Calm.....	Clear.
23	— 10	— 7	(?)	(?)	6	S. E.....	Cloudy; snowed in the afternoon.
24	4	9	12	8	6	S. E.....	Cloudy; snow showers.
25	4	6	13	10	8	S. E.....	Snow showers.
26	6	8	14	12	10	S. E.....	Light showers of snow.
27	5	7	15	13	9	S. E.....	Cloudy.
28	1	2	5	3	2	Calm.....	Clear.
29	— 1	1	4	2	0	Calm.....	Clear.
30	— 4	— 1	8	3	— 1	Calm.....	Clear.
31	— 2	2	18	15	14	S. W.....	Clear; cloudy in the evening.
Nov. 1	0	11	18	14	0	S. W.....	Snowed in the forenoon; at 2 p. m. clear.
2	— 11	— 10	— 5	1	2	Calm.....	Clear; S. W. wind at 4 p. m.; the river froze over last night.
3	2	3	10	10	9	S. W.....	Cloudy; snow showers.
4	8	11	25	22	20	S. W.....	Cloudy; snow showers.
5	— 3	9	10	5	— 3	N.....	Clear.
6	— 6	— 5	4	8	6	S. W.....	Cloudy.
7	— 23	— 15	— 5	— 20	— 23	Calm.....	Clear.
8	— 27	— 25	— 10	— 15	— 19	Calm.....	Clear.
9	— 26	— 23	— 15	— 15	16	Calm.....	Clear; N. wind in the afternoon.

Date.	Lowest.	7 a. m.	12 m.	6 p. m.	10 p. m.	Wind.	Remarks.
1880.							
Nov. 10	— 22	— 20	— 8	— 6	— 5	N. E.....	Light clouds.
11	— 5	— 1	10	6	4	N. E.....	Light clouds.
12	4	36	40	40	39	S. W.....	Cloudy; light showers of rain.
13	24	30	31	28	24	N. W.....	Cloudy.
14	6	6	10	9	8	N.....	Light clouds.
15	4	4	11	10	8	N. W.....	Light clouds.
16	4	6	20	18	15	N. W.....	Light clouds; snowed lightly in afternoon.
17	6	7	11	10	8	N.....	Clear.
18	— 3	— 3	4	8	7	Calm.. ..	Clear to 9 a. m.
19	6	8	12	10	9	S. E.....	Cloudy; snowed lightly in the afternoon.
20	6	7	13	11	10	S. E.....	Cloudy.
21	7	8	15	14	13	S. E.....	Cloudy; light showers of snow.
22	10	11	16	16	14	S. E.....	Cloudy; snowing lightly.
23	12	13	18	16	15	S. E.....	Cloudy; snowing lightly.
24	13	14	20	18	17	S. E.....	Light showers of snow.
25	14	15	19	17	15	S. E.....	Light showers of snow.
26	4	13	12	4	5	N.....	Clear; 1 p. m., calm.
27	— 14	— 13	10	10	9	Calm.....	Clear to 9 a. m.; N. W. wind; cloudy.
28	7	8	18	22	22	S. W.....	Cloudy; snowed lightly all day.
29	21	21	35	34	33	S. W.....	Rained all afternoon.
30	— 6	22	20	— 3	— 6	N.....	Clear; 1 p. m., calm
Dec. 1	— 22	— 22	— 10	— 8	— 4	Calm.....	Clear; 10 a.m., N.E.wind.
2	— 4	2	8	6	4	Calm.....	Cloudy.
3	— 18	— 5	0	— 6	— 18	Calm.....	Clear.
4	— 26	— 25	— 10	— 21	— 26	Calm.....	Clear.
5	— 51	— 41	— 42	— 48	— 51	Calm.....	Clear.
6	— 53	— 53	— 40	— 38	— 35	Calm.....	Clear; 10 a. m., light N. wind.
7	— 40	— 40	— 38	— 34	— 34	Calm.....	Clear.
8	— 37	— 37	— 30	— 31	— 36	Calm.....	Clear.
9	— 50	— 50	— 45	— 40	— 35	Calm.....	Clear; 2 p. m., N. wind.
10	— 35	— 32	— 20	— 20	— 21	N. E.....	Snowing lightly.
11	— 40	— 40	— 30	— 28	— 22	Calm.....	Clear; 9 a. m., N. wind; clear.
12	— 30	— 25	— 26	— 28	— 30	Calm	Clear.
13	— 35	— 35	— 33	— 30	— 25	N..	Light clouds.
15	— 55	— 55	— 40	— 34	— 30	Calm.....	Clear; 10 a. m., N. wind.
16	— 38	— 31	— 32	— 34	— 38	N.....	Clear.
17	— 44	— 44	— 35	— 36	— 38	N.....	Clear.
18	— 60	— 45	— 50	— 54	— 60	Calm.....	Clear.
19	— 66	— 65	— 63	— 65	— 66	Calm	Clear.
20	— 67	— 49	— 40	— 40	— 42	N.....	Clear.
21	— 42	— 35	— 33	— 30	— 30	N.....	Clear.
22	— 30	— 27	— 22	— 20	— 19	N.....	Light clouds.
23	— 31	— 20	— 18	— 25	— 31	N.....	Clear.
24	— 50	— 50	— 48	— 48	— 49	Calm.....	Clear.
25	— 53	— 52	— 50	— 52	— 53	Calm.....	Clear.
26	— 56	— 56	— 50	— 48	— 48	Calm.....	Clear in N. W.

Date.	Lowest.	7 a. m.	12 m.	6 p. m.	10 p. m.	Wind.	Remarks.
1880.							
Dec. 27	— 48	— 47	— 43	— 43	— 41	N.....	Clear.
28	— 41	— 40	— 31	— 22	— 20	N. E.....	Light clouds.
29	— 18	— 18	— 16	— 15	— 16	N. E.....	Light clouds.
30	— 18	— 18	— 15	— 16	— 18	N. E.....	Light clouds.
31	— 24	— 20	— 8	— 5	— 5	N. E.....	Cloudy; snowed in the afternoon.
1881.							
Jan. 1	— 10	— 10	— 5	1	5	S. W.....	Cloudy.
2	0	3	6	3	0	S. W.....	Cloudy; snowed lightly in the afternoon.
3	— 6	— 6	— 5	— 5	— 5	N. W.....	Light clouds.
4	— 6	— 6	— 4	— 4	— 3	N. W.....	Light clouds.
5	— 3	0	3	3	4	N. W.....	Cloudy.
6	— 16	2	— 5	— 10	— 16	N.....	Clear.
7	— 25	— 2	5	7	8	S. W.....	Cloudy; snowed in the afternoon.
8	8	9	12	13	13	S. W.....	Cloudy; snowed lightly all day.
9	10	12	20	18	15	S.....	Light clouds.
10	— 5	— 2	— 5	— 1	5	N.....	Clear; 2 p. m., E. wind.
11	— 8	— 1	0	— 3	— 8	N.....	Clear.
12	— 41	— 32	— 30	— 33	— 41	Calm.....	Clear.
13	— 41	— 35	— 33	— 30	— 28	S. E.	Light clouds.
14	— 28	— 24	— 20	— 17	— 16	S. E.....	Cloudy; snowing lightly in the afternoon.
15	— 25	— 10	— 8	— 16	— 25	S. E.....	Cloudy; 2 p. m., calm and clear.
16	— 30	— 24	— 16	— 10	— 11	S. E.....	Cloudy.
17	— 16	— 16	— 14	— 10	— 8	S. E.....	Cloudy.
18	— 9	— 9	— 5	— 6	— 7	S. E.....	Cloudy.
19	— 10	— 10	— 7	— 9	— 10	S. E.....	Cloudy; snowed lightly all day.
20	— 12	— 11	— 5	— 3	— 2	S. W.....	Light clouds.
21	— 3	— 2	5	5	3	S. W.....	Light clouds.
22	2	10	22	21	19	S. W.....	Cloudy; snowed nearly all day.
23	— 21	— 10	— 12	— 14	— 21	Calm.....	Clear.
24	— 35	— 35	— 30	— 18	— 12	Calm.....	Clear; 2 p. m., S. E. wind; cloudy.
25	— 12	— 6	— 2	— 1	— 1	S. E.....	Cloudy.
26	— 1	1	3	4	4	S. E.....	Cloudy; snowed in the afternoon.
27	4	5	8	8	6	S. E.....	Cloudy.
28	3	3	10	8	5	W.....	Clear.
29	— 13	— 12	— 8	— 8	— 13	Light N....	Clear.
30	— 25	— 20	— 15	— 20	— 25	Calm.....	Clear.
31	— 48	— 45	— 36	— 41	— 48	Calm.....	Clear.
Feb. 1	— 54	— 54	— 41	— 35	— 32	Light N....	Clear.
2	— 53	— 53	— 38	— 34	— 34	Light N....	Clear.
3	— 36	— 36	— 25	— 25	— 27	Light N....	Clear.
4	— 28	— 28	— 25	— 26	— 26	Light N....	Clear.
5	— 26	— 15	— 2	— 2	— 5	S. E.....	Cloudy; snowed lightly all day.
6	— 20	— 20	— 10	— 18	— 18	Calm.....	Clear.
7	— 18	— 10	— 3	— 3	— 4	N. W.....	Cloudy.

Date.	Lowest.	7 a. m.	12 m.	6 p. m.	10 p. m.	Wind.	Remarks.
1881.							
Feb. 8	—10	—10	— 4	— 5	—10	N. W.....	Clear.
9	—40	—25	—20	—31	—40	Calm.....	Clear.
10	—46	—46	—31	—39	—45	Calm.....	Clear.
11	—49	—49	—35	—41	—46	Calm.....	Clear.
12	—51	—51	—34	—35	—41	Calm.....	Clear.
13	—48	—48	—31	—35	—40	Calm.....	Clear.
14	—47	—47	—40	—25	—21	Light N...	Clear.
15	—21	—18	— 5	— 6	—12	N. E.....	Light clouds.
16	—19	—18	— 2	— 8	—15	S. E.....	Clear.
17	—23	—19	— 5	— 5	—16	S. E.....	Clear.
18	—25	—25	— 8	—15	—24	Light N...	Clear.
19	—48	—48	—25	—38	—40	Calm.....	Clear.
20	—49	—49	—27	—35	—39	Calm.....	Clear.
21	—47	—47	—25	—36	—40	Calm.....	Clear.
22	—46	—46	—23	—33	—40	Calm	Clear.
23	—47	—47	—25	—35	—41	Calm	Clear.
24	—50	—50	—26	—34	—39	Calm.....	Clear.
25	—49	—49	—25	—34	—41	Calm.....	Clear.
26	—58	—58	—26	—41	—46	Calm.....	Clear.
27	—57	—57	—36	—33	—30	Calm.....	Clear; 2 p. m., light N. wind.
28	—37	—37	—26	—30	—36	Light N....	Clear.
Mar. 1	—43	—43	—16	—18	—22	Light N....	Clear.
2	—36	—22	3	— 7	—16	S.....	Clear.
3	—20	—20	4	— 3	— 6	S.....	Clear.
4	— 6	— 6	3	1	— 2	S.....	Clear.
5	—10	— 7	5	3	—10	S.....	Clear.
6	—30	—30	— 4	— 4	— 6	E.	Clear.
7	—19	—19	— 3	— 4	—18	E.	Clear.
8	—26	—20	— 2	— 2	— 3	S. E.....	Light clouds.
9	— 9	— 9	— 2	— 3	— 4	S. E.....	Light clouds.
10	— 6	— 5	2	0	— 1	S. E.....	Light clouds; snowed lightly in afternoon.
11	— 6	— 6	— 3	— 4	— 6	E.	Clear.
12	—24	—14	— 5	—13	—24	N.....	Clear.
13	—37	—30	—12	— 6	— 7	N.....	Clear.
14	—10	— 4	20	10	3	S.....	Clear.
15	— 1	— 1	10	8	0	S. E.....	Light clouds.
16	—15	—15	10	5	— 2	S. E.....	Light clouds.
17	—17	— 9	11	11	9	S. E.....	Cloudy.
18	— 1	— 1	23	18	5	Light S.W.	Clear.
19	—10	0	20	25	30	S. W.....	Cloudy; snowed nearly all day.
20	16	29	36	27	16	.....	Snowed in the forenoon; clear at 2 p. m.
21	— 2	1	24	22	15	Light S. E.	Cloudy.
22	— 3	2	26	25	17	Light S. E.	Cloudy.
23	— 2	2	25	24	23	Light S. E.	Cloudy; snow showers all day.
24	9	14	22	18	9	E.	Clear.
25	—10	—10	20	16	10	E.	Clear.
26	—15	—15	16	9	2	E.	Clear.
27	—16	—10	10	11	11	E.	Clear; cloudy in the evening.

Date.	Lowest.	7 a. m.	12 m.	6 p. m.	10 p. m.	Wind.	Remarks.
1881.							
Mar. 28	9	10	22	25	24	N. E.....	Cloudy.
29	10	10	36	40	20	S. W.....	Cloudy; rained all the afternoon.
30	24	25	38	37	35	S. W.....	Cloudy.
31	30	34	45	40	30	S.....	Clear.
April 1	20	22	47	43	40	S.....	Clear; afternoon cloudy.
2	30	31	48	44	30	S.....	Clear.
3	26	28	44	42	37	S. E.....	Snowed in the forenoon; light showers of snow in the afternoon.
4	35	38	43	40	37	W.....	Cloudy; clear in the evening.
5	18	21	44	40	30	Calm.....	Clear.
6	12	13	37	36	34	Calm.....	Clear; 3 p. m., N. W. wind and cloudy.
7	23	30	36	30	23	Light N.W.	Clear.
8	12	13	33	32	28	Light N.W.	Clear.
9	10	11	35	33	24	Light N.W.	Clear.
10	11	13	38	35	26	Light N.W.	Clear.
11	8	11	35	34	24	Light N.W.	Clear.
12	14	15	38	37	34	S. E.....	Light clouds.
13	26	30	43	40	26	E.....	Clear.
14	15	16	42	40	27	E.....	Clear.
15	18	21	47	45	36	Light S....	Clear; geese were seen today.
16	15	22	49	48	35	S.....	Light clouds.
17	25	27	47	46	40	S.....	Light clouds.
18	33	40	50	49	41	S.....	Light clouds.
19	25	30	49	48	39	S.....	Light clouds.
20	19	26	50	49	44	S.....	Light clouds.
21	33	40	50	47	41	S.....	Light clouds.
22	31	32	42	39	31	S. E.....	Cloudy.
23	28	30	40	37	30	S. E.....	Cloudy.
24	19	24	39	38	36	Light N....	Clear.
25	31	34	40	39	32	Light N....	Clear.
26	25	28	41	37	32	N. E.....	Showers of snow and rain during the day.
27	28	30	38	35	29	E.....	Clear.
28	25	27	39	35	28	E.....	Clear.
29	15	19	40	39	27	N.....	Clear.
30	20	27	42	40	32	S. W.....	Cloudy in the afternoon.
May 1	19	23	40	39	35	S. W.....	Morning clear; snowed in the afternoon.
2	31	36	43	41	33	S. W.....	Showers of snow in the afternoon.
3	25	31	36	30	25	Light N....	Clear.
4	15	25	38	35	30	N. W.....	Cloudy in the afternoon.
5	20	25	35	30	24	N.....	Clear.
6	10	12	31	28	23	N.....	Clear.
7	20	23	35	38	35	N. E.....	Cloudy.
8	22	27	45	46	37	S. W.....	Cloudy; light showers of rain in the afternoon.
9	26	30	45	43	34	S. W.....	Cloudy; showery all day.
10	20	25	50	49	39	S. W.....	Light clouds.

Date.	Lowest.	7 a. m.	12 m.	6 p. m.	10 p. m.	Wind.	Remarks.
1881.							
May 11	33	39	54	48	39	S. W.....	Cloudy in the afternoon.
12	34	38	50	45	34	S. W.....	Cloudy; showery all the forenoon; clear in the afternoon.
13	28	35	50	49	40	S. W.....	Cloudy.
14	30	36	54	46	33	S.....	Clear; the ice started in the river this afternoon, ran 1 hour, and stopped.
15	25	34	55	54	45	S.....	Light clouds.
16	38	43	58	56	47	S.....	Light clouds; the ice started again at 4 a. m.
17	40	45	42	46	40	E.....	Showery all day; plenty of ice still passing in the river.
18	35	40	45	44	35	E.....	Rained nearly all day; clear at 6 p. m.
19	30	36	54	50	42	S. W.....	Cloudy in the afternoon; there is still plenty of drift ice in the river.
20	33	37	50	45	43	S. W. . . .	Cloudy; showery in the afternoon; the river is almost clear of ice.
21	36	40	50	46	42	S. W.....	Rained all the afternoon.
22	35	38	43	40	36	N.....	Clear.
23	28	31	40	39	36	N.....	Clear; start for St Michael tomorrow.

THE RUSSIAN CENSUS OF 1897

Until the present year the population of the whole Russian Empire has never been definitely known. Instead of a census the Russian government has depended in the past on partial enumerations, known under the name of "Revisions," of which there have been ten, five in the eighteenth century and five in the nineteenth century. The "Revision" of 1851 gave a population of 67,380,645, and that of 1885, which was not considered entirely trustworthy, aggregated 108,819,332.

According to the census of 1897 the population of the Russian Empire is 129,211,113. The distribution in various parts of the Empire is as follows: European Russia, 94,188,750; Poland, 9,442,590; the Caucasus, 9,723,553; Siberia, 5,731,732; Turkestan and the Transcaspian region, 4,175,101; the Steppes, 3,415,-174; Finland, 2,527,801; Russian subjects in Bokhara and Khiva, 6,412. The most densely populated regions are Poland, 192.6

inhabitants per square mile; the Caucasus, 53.7, and European Russia, 50.6. Siberia contains only one person to each square mile, and the Steppes eight persons.

Mr John Karel, Consul-General of the United States at St Petersburg, points out the peculiar distribution of the population of European Russia. He says:

> The distribution of the 94,000,000 inhabitants in European Russia depends principally upon the natural and economic conditions of the plain of Russia, which is cut diagonally from Podolia and Bessarabia to the government of Viatka by the chernoziom (black earth) region. This region comprises less than 658,740 square miles, but if the non-chernoziom governments, in which is included the Moscow industrial district, be added thereto, it contains more than 746,572 square miles, *i. e.*, two-fifths of the whole plain of European Russia, which, according to the census, is inhabited by 63,000,000 people, or by two-thirds of the whole population of European Russia.
>
> The most compact population is centered on the narrow strip formed by the governments of Podolia, the chernoziom part of Volyn, the larger part of Kiev and Poltava, the chernoziom part of Chernigov, the non-steppe chernoziom parts of Kharkov and Voronezsh, and the chernoziom parts of Orel, Tambov, Riazan, and Tula.

The present tendency of population to drift to the cities, less marked in Russia than in Europe generally, is shown by the fact that there are no fewer than 123 cities in which the population exceeds 25,000. The 20 most populous cities are as follows: St Petersburg, 1,267,023; Moscow, 988,610; Warsaw, 614,752; Odessa, 404,651; Lodz, 314,780; Riga, 282,943; Kiev, 248,750; Kharkov, 170,682; Tiflis, 159,862; Vilna, 159,568; Tashkent, 156,506; Saratov, 133,116; Kazan, 131,508; Ekaterinoslav, 121,216; Rostoff-on-Don, 119,889; Astrakhan, 113,075; Baku, 112,253; Tula, 111,048; Kishinev, 108,506; Nijni-Novgorod, 98,503.

A. W. G.

The surprisingly early availability of the Russian census returns is due to the employment of the Hollerith tabulating machine, first used for census purposes by the United States government in 1890.

Out of 2,403,750 Germans who left their native land between 1871 and 1896 about 96 per cent emigrated to the United States. Failing to divert the tide of emigration toward the German colonies in Africa, the government is now seeking to direct it toward certain parts of South America, in preference to the United States, where the peculiarities, language, and customs of the Germans are lost by assimilation and emigrants become competitors with the artisans and agriculturists of the mother country.

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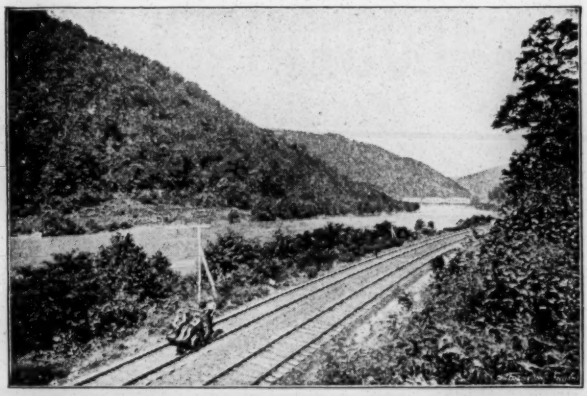

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